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position such as the present-day vitamine preparations. For these reasons work on the chemical composition of vitamins is urgently needed as the previous attempts along these lines have been more or less unsuccessful. This paper deals principally with the antineuritic vitamine.

As it has been found that brewer's yeast is very rich in antineuritic vitamine, this material was selected for this investigation. At first autolyzed yeast was used, but on account of its complex composition it was later on substituted by dried yeast. The general conclusions derived from this work are as follows:

Autolyzed yeast filtrate, on account of its complexity, represents an unsatisfactory material for the chemical isolation of the antineuritic vitamine. Mastic emulsion, Lloyd's reagent (fullers' earth), ferric phosphate, etc., are unsatisfactory adsorbing reagents in that they lack specificity. These reagents remove, also, inactive basic materials which cannot be separated by our present methods from the active material. Olive oil and oleic acid will remove the antineuritic substance from autolyzed yeast filtrate, thus showing that it is fat-soluble as well as water-soluble in the form of a crude extract. Stachydrine, trigonelline and allied betaines show no antineuritic activity. Histidine and its esters are likewise inactive.

The active material is readily extracted from dried yeast by means of acid methyl alcohol. The extract can be purified by use of the Funk silver method and the mercuric sulphate procedure, yielding an apparently crystalline active substance. This substance becomes inactive upon drying and it is believed that impurities still remain which can be removed with additional modifications of the method described in this paper (see, *J. Biol. Chem.*). The present method eliminates purines, histidine, proteins and albumoses, leaving a liquid that can be crystallized and probably contains histamine or histamine-like substances. The physiological action of the active fractions resembles that of extracts from the mucosa of the small intestine, when the intestinal and yeast extract are purified in the same manner.

A NEW METHOD OF DETERMINING THE SOLAR CONSTANT OF RADIATION

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The Smithsonian Astrophysical Observatory has been engaged for more than ten years in measuring the intensity of the solar radiation at the earth's surface under such conditions that the intensity as it would be outside the atmosphere may be computed from the observations. The

method employed hitherto has been the method of Langley which consists of two essential parts. First, measurements with the pyrheliometer of the intensity of solar radiation at the earth's surface. Second, measurement by the spectro-bolometer, covering several hours' time, designed to determine the transparency of the atmosphere for all colors in the spectrum. This latter part of the work demands a uniform transparency of the atmosphere during the several hours required for determining it. This condition is never perfectly met by terrestrial conditions. The changes in the atmospheric transparency not infrequently introduce an error of 1 and sometimes 2 or 3% in the results of the observations at the best stations, although on many days of observation the condition of uniform transparency is so well fulfilled that the results appear to be accurate to a fraction of 1%. If we were interested only in the absolute value of the solar constant of radiation it would be possible to nearly eliminate this source of error by a sufficient number of observations. But it has been shown that it is highly probable, I may say indeed certain, that the solar radiation is variable from day to day through a range of several per cent. The source of error which has been described is a principal difficulty against determining the real variations of the sun on which variations of the weather seem to depend.

My colleagues and myself have long sought to discover a method of determining the solar radiation outside the atmosphere which would be independent of these variations of transparency. We sought to do this through the observations of the brightness of the sky. It is well known that the sky owes its brightness to the scattering of the solar rays by the molecules and small particles which compose our atmosphere. The more hazy the sky, the greater its brightness and the less the atmospheric transparency. Accordingly, it seemed to us hopeful to determine the atmospheric transmission coefficients in terms of the brightness of the sky. We employed in the investigation a new instrument which we call the pyranometer designed to measure the brightness of the whole sky or of any fraction of it, either on a horizontal surface or on a surface at right angles to the average direction of such a portion of the sky as might be under observation. While at Calama, Chile, in June, 1919, I took up the matter with Mr. Moore, the director of the Smithsonian observing station there. He placed at my disposal determinations of the transparency of the atmosphere for nearly forty wave-lengths, pyranometer values representing the intensity of the radiation of the sky in a zone 15° wide surrounding but not including the sun, and measurements of the intensity of the solar radiation by the pyrheliometer and by the spectro-bolometer. All of these values were tabulated with the solar constant values for 60 days of observation. The pyranometer values and values of a function which we call ρ/ρ_{sc} were taken on each day at the periods

when the air masses were 2 and 3, respectively, that is to say, when the zenith distance of the sun is about 60° and about 70° .

The function ρ/ρ_{sc} is determined in this way: A spectrum-energy curve taken through the solar spectrum shows deep depressions in the infra-red spectrum, one of which was termed by Langley $\rho\sigma\tau$. Measurement is made of the ordinate of the smooth curve drawn across the top of the depression, and another measurement of the ordinate at the minimum of the depression. The ratio of these two ordinates forms the function ρ/ρ_{sc} . It is a measure, as Mr. Fowle has shown, of the quantity of humidity prevailing in the atmosphere between the observer and the sun. Mr. Fowle indeed has worked out a method of determining the actual amount of precipitable water in the vertical column of the atmosphere by a mere measurement of the value ρ/ρ_{sc} .

Since the haziness of the atmosphere is closely related to its humidity, but since the haziness also depends upon the amount of dust taken up from the soil by the wind, or such as is occasionally distributed in the upper air by volcanic eruptions, we hoped to get a complete indicator of the haziness prevailing by a combination of the value ρ/ρ_{sc} with the value of the sky brightness, determined by the pyranometer, in the immediate neighborhood of the sun. We formed the function "sky brightness divided by ρ/ρ_{sc} ," which we will call " F ." After a number of unsuccessful investigations I was led by a suggestion of Mr. Moore's to find that the values of the atmospheric transmission coefficients for the individual wave-lengths in the spectrum could be represented in terms of the function " F " by smooth curves in which atmospheric transmission coefficients were plotted as ordinates and the function " F " as abscissae. All of the data for the sixty days available were plotted in this manner for each of the 40 wave-lengths above mentioned. The atmospheric transmission coefficient varies by only 2 or 3, or at most 5% in any part of the spectrum, while the function " F " varies through a range of from 100 to 1000 or more on a certain scale. Hence, it is clear that great errors in determining the function " F " would produce very small errors in determining the atmospheric transmission.

The measurements required to determine the function " F " may be all completed within ten minutes. Entering the plots above mentioned with the values of the function " F " as thus determined, we take out from the plots the atmospheric transmission coefficients for all wave-lengths in the spectrum. With these data we may immediately determine the solar constant of radiation by the usual method of computation.

The new method has been in application at Calama, Chile, since about July 1. Measurements by the older method, on which it is primarily based, have been taken on about one-third of the days, and measurements by the new method on practically all days since July 1. It is found that the agreement between the results of the older method and of the new

abridged method is very close. In a comparison recently made, covering 53 days on which observations by both methods were available, it was found that on 32 days the result by the new and the old methods agreed within less than 1%, and on 45 days within less than 2%. It was found, also, that on the days in which the agreement was not good, some change in transparency appeared to be occurring which would reasonably account for the discrepancy on the ground that the value by the old method had been impaired thereby.

The new method is applicable on many more days than the old, and it has the further advantage that several independent observations of the solar constant of radiation may be made by the new method on a single day of observation. We believe that by checking the new method against the old from time to time it will be possible to assure ourselves of the accuracy of it, and we propose to employ it principally, hereafter, in our determinations of the solar constant of radiation.

THE BASAL METABOLISM OF BOYS FROM 1 TO 13 YEARS OF AGE

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The Nutrition Laboratory has been occupied for a decade in an effort to chart the field of the basal metabolism of humans of both sexes and of all ages. By basal metabolism is meant the heat production for maintenance during complete muscular repose and without active digestion. From a biometric analysis¹ of the studies already made of men and women, it is clear that weight, stature, age, and sex all have an independent influence upon the basal metabolism.

With growing boys the rapid changes in weight, stature, and age make metabolism measurements of unusual interest. The data that are reported herewith, representing 128 observations on boys ranging in age from a few months to 13 years and above, were all obtained with the coöperation of Dr. Fritz B. Talbot of Boston and the detailed results of the investigation will shortly be published in conjunction with him by the Carnegie Institution of Washington.

The total calories per 24 hours referred to weight are indicated for all the subjects in the chart. A general inspection of this chart shows a distinct trend which follows a reasonably regular course. The scatter of the points about this curve is perhaps surprisingly small, especially when we consider the usual scatter with adults. Indeed, until the collection of